2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

TITLE 4
BUILDING REGULATIONS

CHAPTERS:

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-01
ADMINISTRATIVE ENACTMENTS

The following applies to Chapters 4-01 through 4-09

SECTIONS:

4-01-001-0001 Definitions

As used in this City of Flagstaff 2011 Building Code Amendments and all of the referenced herein adopted International Codes, the following terms shall have the meaning herein prescribed:

A. Wherever the word "Municipality" or "[Name of Jurisdiction]"is used, it shall be mean the City of Flagstaff.

B. Wherever the term "Department of Building Safety" is used, it shall mean "Development Services Division."

C. Wherever the term "Corporation Counsel" is used in this Chapter, it shall mean the Attorney for the City of Flagstaff (Ordinance 587:8-14-62).

D. Wherever the term "Administrative Authority" is used in conjunction with publicly provided utilities (natural gas, electricity, internet and broad band service, telephone, and cable television), it shall mean the current contract company providing the respective service. Wherever the term "Administrative Authority" is used in conjunction with publicly provided utilities or permits (water, sewer, storm water management and/or building permits), it shall mean the City of Flagstaff.

4-01-001-0002 Adoption of 2006 International Building, Residential, and Plumbing Codes, with amendments, additions, and deletions

thereto; 2011 National Electrical Code, with amendments, additions, and deletions thereto;

There are hereby adopted by the City Council of the City of Flagstaff for the purposes of establishing rules and regulations for the construction, alteration, removal, demolition, equipment, use and occupancy, alteration, removal, maintenance of buildings and structures, including permits and penalties, those certain International Codes known and referred to with particularity as the International Building Code (IBC), 2006 Edition, providing for amendments, additions and deletions thereto and International Residential Code (IRC), 2006 Edition, providing for amendments, additions and deletions thereto; International Plumbing Code (IPC), 2006 Edition, providing for amendments, additions and deletions thereto, the 2011 National Electrical Code, providing for amendments, additions and deletions thereto; International Mechanical Code, 2006 Edition, providing for amendments, additions and deletions thereto; International Fuel Gas Code, 2006 Edition, providing for amendments, additions and deletions thereto; International Existing Building Code, 2006 Edition, providing for amendments, additions and deletions thereto; Uniform Housing Code, 1997 Edition, Uniform Administrative Code, 1997 Edition, and Uniform Code for the Abatement of Dangerous Buildings, 1997 Edition, three (3) copies of which are on file in the office of the City Clerk of the City of Flagstaff, and the same made part hereof by this reference as if fully and completely herein set forth. The provisions of the aforestated Codes, 2006 editions, shall be controlling for construction within the corporate limits of the City of Flagstaff.

4-01-001-0003 SAVING CLAUSE

Nothing in this Chapter or in the International Building Codes hereby adopted shall be construed to affect any suit or proceeding now pending in any court, or any rights acquired, or liability incurred, or any cause or causes of action acquired or existing, under any act or ordinances replaced hereby. Nor shall any right or remedy of any character be lost, impaired, or affected by this Chapter.

4-01-001-0004 VIOLATION AND PENALTIES

A. Violations. It shall be unlawful for any person, firm or corporation to erect, construct, enlarge, alter, repair, move, improve, remove, convert, demolish, equip, use or maintain any building or permit the same to be done in violation of this Code.

B. Penalties. Any person, firm, or corporation violating any provision of this Code shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punishable by a fine and/or imprisonment set forth by the governing laws of the jurisdiction. Each separate day or any portion thereof, during which any violation of this Code occurs or continues, shall be deemed to constitute a separate offense.

4-01-001-0005 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the International Codes 2006 Editions and the National Electrical Code , 2011 Edition.

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

(Amended, Ord. 2009-06, 07/18/2009; Amended Ord. No. 2011-12, (July 19, 2011)

CHAPTER 1, ADMINISTRATION

Amend Section R103.1 IRC and 103.1 IBC to read:

The Development Services Section, Building Safety Program, is appointed as the regulating office and the Building Official is known as the code official.

(Amended Ord. No. 2011-12, (July 19, 2011)

Revise the amendments to Sections R104.7, 104.7, and 104.8 by striking the third paragraph:

The Building Official shall keep comprehensive records of applications or permits issued, or certificates issued or inspections made, or reports rendered and of notices of orders issued.

All such records shall be open to public inspection for good and sufficient reasons at the stated office hours but shall not be removed from the office of the Building Official without his written consent. All records are kept in both hard copy and electronic format. The electronic format information may be requested on a "walk-in" basis and reviewed during normal working hours; copies or inspection of original documentation requires written notice and reasonable amount of time for Staff to collect the required records from an off-site warehouse location. Written requests will go through the City Clerk's office for processing. (Amended Ord. No. 2011-12, (July 19, 2011))

Amend Table R301.2 (1) "Climatic and Geographic Design Criteria" as follows:

This information may be used by Design Professionals in lieu of the tables provided in Chapter 16 of the International Building Code (IBC), 2006 Edition.

Roof Snow Load:(Measured on the roof)	40 pounds per square foot
Ground Snow Load (where accounting has been given for factored snow loads as given in ASCE 7, Chapter 7. No reduction for slopes less than 45 degrees without providing engineering and/or approval by the Building Official)	50 pounds per square foot
Wind Speed:	90 miles per hour
Wind Exposure Category:	"B"
Seismic Design Category:	"C"
Weathering:	Severe
Frost line depth:	30 inches
Termite:	Moderate to Heavy
Decay:	Moderate
Rain fall – 100 year	2.5 inches per hour
Winter Design Temperature:	4 degrees (F)
Ice Shield Under-layment Req'd:	Yes

Flood Hazards:	1-19-83; 9-18-90*
Air Freezing Index:	1014
Mean Annual Temperature:	45.4 degrees (F)
Climate Zone (IECC, Table 301.1):	Zone 5

* The flood hazard dates reflect the current National Flood Insurance Program and the date of the currently effective "Firm" Map (used by the City of Flagstaff). These maps are updated by the issuing agency and adopted by Storm Water Management without notice.

(Amended Ord. No. 2011-12, (July 19, 2011))

Amend Sections R105.2 and 105.2, Work Exempt from Permits, by adding:

Garden walls, fences less than 6 feet in height, decks/patios less than 30" above finished grade and all accessory structures under 200 square feet will require a zoning permit as approved under COF Ordinance 2006-12

(Amended Ord. No. 2011-12, (July 19, 2011))

Delete Sections R105.5 IRC and 105.5 IBC, Expiration, and replace with:

Every residential permit issued shall become invalid unless the work authorized by such permit is completed within one year (365 days) from the issuance date of the building permit. The Building Official is authorized to grant, when request for extension is received in writing, one extension not to exceed 180 days. The extension shall demonstrate cause such as financial, weather delays, material delivery, etc. The permit may be extended for an additional year (365 days) by paying one half the original permit fee (not including the plan check fee), thereby allowing a maximum time of completing the project to 30 months. Failure to obtain a certificate of occupancy within 30 months shall result in a report being recorded with the Coconino County Recorder's office for incomplete work or no final inspection report of the project. All residential "over-the-counter" permits for plumbing, mechanical, electrical and re-roofing shall be valid for a maximum period of 180 days.

All commercial construction permits for new, remodels, additions, and alterations shall be valid for a maximum period of 720 days. One extension shall be granted for an additional 360 days when requested in writing and justifiable cause is demonstrated. After the one time extension has expired, the next additional extension will require the applicant to pay one-half the permit fee for an additional 360 day extension. Permits not passing final inspection over 1440 days will be expired and the applicant must submit for a new permit and pay all associated fees. All commercial "over-the-counter" permits for plumbing, mechanical, electrical and re-roofing shall be valid for a maximum period of 180 days.

(Amended Ord. No. 2011-12, (July 19, 2011))

Amend Section 105.2, Electrical, by adding:

Approved portable equipment used in conjunction with special events in public locations (parks, parking lots, public owned land, et cetera) of 25 kw or greater will have an over-the-counter electrical permit issued and a licensed electrical contractor for installation or set up.

The issuance of an electrical permit shall not be construed as an approval by the electrical inspector of any diagrams, drawings, specifications, or details of such contemplated work insofar as the same or any portion thereof is in conflict with this Chapter or any other rules or regulations governing electric installations in the City of Flagstaff. The holder of an electrical permit shall not do or perform any work other than that designated in the application for said permit without first notifying the electrical inspector and paying the additional fee therefore. No work shall be permitted at any location other than that designated by the permit. The electrical inspector must be given immediate notice when an installation is ready for either rough or final inspection.

(Amended Ord. No. 2011-12, (July 19, 2011))

Amend Section 105 IBC by adding Section 105.8, Temporary Permit:

Section 105.8. Temporary Permit. Permits may be issued by the Building Official for the use of certain classes of temporary open wiring such as for carnivals, fairs, demonstrations, evangelistic meetings, town parties, auction sales, and others. Such permits shall be granted for a period of two (2) weeks only, with a possible extension of one (1) week if the circumstances are justified in writing to the Building Official. No such temporary permits shall be granted in succession at the same location, and under no circumstances shall any person connect or put into service any temporary wiring until a permit has been obtained.

Temporary permits shall also be granted for the use of temporary wiring for lights and power on buildings under construction. Such permits are void automatically upon cessation of active construction or when, in the judgment of the Building Official, such wiring becomes hazardous. Provisions of Article 525 of the National Electrical Code (NEC), 2011 Edition shall be followed with respect to temporary wiring.

(Amended Ord. No. 2011-12, (July 19, 2011))

Amend Section R106.1.1, Information on Construction Documents, by deleting the first sentence and replace with:

Construction documents shall be drawn upon suitable material, drafting paper, vellum, etc. and shall be a maximum size of 24” x 36”, size D paper. The minimum size of drawings that have the minimum required drawings (site plan, foundation plan, floor plans for each floor, elevations, framing plans, roof & floor manufactured layout plans, critical sections, and details will be 18” x 24”). Floor framing, foundation, roof framing and floor plans must be drafted to the same scale, i.e., ¼”=1’-0”. The minimum size for amended cut-sheets or details will be 8-1/2” x 11” and will not exceed the maximum sheet size.

Larger sized drawings must be approved by the Building Official and justification established for why drawings can't be presented on the smaller size sheets. [It is expected that larger commercial projects will fall into this exception]. The written scope or description of the work may be provided on the building permit application form as long as it describes accurately the work to be performed.

All structural elements (i.e., posts and beams) shall be on the related plan sheet(s) which corresponds to the work being proposed.

Embedded anchors shall be on the foundation plan. Post bases/caps shall be on the framing plan or shown on specific details for the assembly.

Each floor shall have its own framing plan. First floor framing will not be superimposed on second floor framing or roof framing plans as an example.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Section 106.1 IBC, Submittal Documents, by adding:

Residential, single family detached, structures are exempt from the requirements for a Design Professional under Arizona Revised Statutes (ARS 32-121 et. seq.) unless circumstances dictate the need for professional design submittal. Duplexes and triplex units which do not exceed 3,000 square feet, two stories or a total occupant load of 20, may also be designed by a non-registrant as long as the unit(s) has/have only one owner.

Sub-assemblies, such as roof trusses or manufactured floor beams that indicate all imposed loading may be submitted without the "stamp" of an Arizona certified or registered Design Professional.

Any retaining walls having any imposed surcharges from adjacent structural elements or unbalanced loading that exceed four (4) feet (1224 mm), shall be designed by an Arizona certified or registered Design Professional and shall be submitted at the time of permit application.

Pursuant to Arizona Revised Statutes § 32-121 et.seq. governing the regulation of Design Professionals (i.e. architects and engineers), all commercial occupancies for new construction, additions, alterations or repairs within the City of Flagstaff shall be prepared by an Arizona certified or registered Design Professional in good standing when:

1. The total square footage of any building exceeds 3,000 square feet, or
2. The total occupancy of the building exceeds 20 people, or
3. Any structural member required for the project exceeds twenty feet (20') in length.

The certified or registered Design Professional of Record must provide his/her "stamp" upon all working drawings. Drawings not prepared by the Design Professional of Record may be annotated as such, but the "stamp" shall be affixed to all the drawings in the construction working

drawings set to indicate that coordination of the total project has been done by the Design Professional of Record.

A design professional is required for electrical service entrance sections of 600 amps and greater.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Sections 108.4 and R108.4 by adding:

Any person who commences any work on a building, structure, electrical, gas, mechanical, or plumbing system before obtaining the necessary permits shall be subject to an investigation fee of $94.00 or twice the permit fee, whichever is greater.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Sections R108.5 IRC and 108.5 IBC, Related Fees, by adding:

The fee schedule shall be based upon the 1997 Uniform Administrative Code, Table 3D, and shall be annually reviewed and the revised fees published by the Building Safety Program, Development Services Section. Valuation fees for commercial work shall be annually reviewed in accordance with the International Code Council Building Safety Journal Fee structure. Residential fee valuation shall be subject to approval for increases by the City of Flagstaff Council based upon the recommendation of the Building Official and shall be published for public review.

(Amended Ord. No. 2011-12, (July 19, 2011))

Amend Sections R108.6 IRC and 108.6 IBC, Refunds, by adding:

The applicant may receive up to 80% refund for the total building permit fee if no work has begun and no inspections have been performed. No refund of the plan review fee is authorized after the permit has been issued. The refund of a plan review fee is also limited to 80%, assuming that no review has been performed. The Building Official shall determine, based upon work done, how much of fees paid are actually refunded. There shall be no refund of any required deposit once the administrative routing and plan review process has begun.

(Amended Ord. No. 2011-12, (July 19, 2011))

Add Sections R108.7 IRC and 108.7 IBC, Re-Inspection Fee(s) as follows:

Re-inspection fees may be assessed for each inspection or re-inspection when the portion of work for which the inspection was scheduled is not complete or when corrections from a previous inspection are not made. Other events which may require the imposition of a re-inspection fee are: failure to have the inspection record on the job site when the inspector arrives; the approved plans not on the job site for the inspector to review; and failure to provide access to the job site or area to be reviewed by the inspector. Appeals for such fees are made to the Building and Safety Manager. To obtain a re-inspection after the

inspector has left notice that a fee must be assessed; the applicant must pay a $94.00 fee.

(Amended Ord. No. 2011-12, (July 19, 2011))

Amend Sections R110.4 IRC and 110.3 IBC, Temporary Occupancy, by adding.

Temporary Certificate of Occupancies for residential construction (detached single family dwellings and duplexes) is not authorized.

Exceptions: (1) When a driveway approach cannot be poured due to weather, then the Building Official can approve a temporary Certificate of Occupancy after the applicant has posted a bond with the City of Flagstaff; (2) If the structure meets all the requirements for habitable space and sanitation, then a Certificate of Occupancy will be granted. Any unfinished items (i.e. extra bonus rooms, basement finishing, etc.,) will be annotated in the inspection record as "not inspected" at the time of Certificate of Occupancy issuance. Applicants moving into a dwelling prior to receiving a Certificate of Occupancy may be evicted as the property is posted "NO OCCUPANCY" by the building inspector or Building Official.

Construction Hours:

Refer to Ordinance 2004-21 of the City Code, Chapter 6-08, Noise Control, Section 6-08-001-0002 for time frames on noise restrictions.

(Amended Ord. No. 2011-12, (July 19, 2011)

CHAPTERS 2 OF IRC AND IBC, DEFINITIONS

Amend IBC Section 202 by adding the following definitions:

ACCESSORY DWELLING UNITS. An Accessory Dwelling Unit (ADU) may be either attached or detached and is secondary to the primary residence. The full definitions and application of constructing an ADU is covered under COF Ordinance 2007-20, adopted on 20 March 2007. The ADU is limited in size to be not less than 300 square feet and not greater than 500 square feet in size on lots less than one acre. For lots one acre and larger, the size is limited to 800 square feet maximum. The ADU shall provide complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

ACCESSORY ENERGY SYSTEMS. An accessory energy system will include wind turbines, PV solar, thermal solar, geo-thermal, bio-mass and other technologies that provide heating, cooling or electrical energy. The systems will be subject to a building permit and limited by zoning ordinances for visual, design, height and setback requirements.

CITY shall mean the City of Flagstaff.

CONDOMINIUMS. Condominiums are defined in the International Building Code, 2006 Edition as an R-2 occupancy and will not be reviewed using the 2006 IRC. Condominiums are a collection of individually owned parcels or individual units within a common structure, combined with a joint ownership of commonly used property (sidewalks, hallways, stairs, etc.). The condominium is defined as the ownership of air-space with no ground attached.

INSPECTION is an examination by which a qualified person conducts an investigation of a completed trade, such as framing, electrical, plumbing or mechanical to assure compliance with adopted minimum codes, or to investigate sub-standard housing as defined in the Uniform Housing code, or investigate dangerous conditions as defined per the Uniform Code for the Abatement of Dangerous Buildings.

LADDER BACKING shall mean or refer to wood construction used at perpendicular or angular intersections of non-load bearing walls between stud bays.

STOCKPILING shall mean the same as fill, except that it is assumed to be loose un-compacted material that is placed on a site for a temporary period of time. Stockpiling shall require a grading permit when it exceeds 50 cubic yards and shall not remain on the site for more than six (6) months without written permission from the Building Official or the City Engineer.

TEMPORARY shall mean a period not to exceed six (6) months.

TOWNHOUSES. Attached dwelling units with a legally described property line between units (two or more units; shall be reviewed using the International Residential Code, 2006 Edition, unless approved by the Building Official to be reviewed using the International Building Code, 2006 Edition. Developers must maintain a five (5) foot clearance on townhouse end units between the property line and the face of the structure to allow for openings in the side walls of the individual units. Exceptions would be a recording of a "five (5) foot no-build easement on the Final Plat" or the unit is adjacent to a public right-of-way.

USABLE SPACE. Any space which can be either occupied, used for storage of materials and/or service area which houses mechanical equipment. The space may or may not have environmental conditioning. The usable space will include access corridors, utility closets, mezzanines, basements, crawl space storage, attic areas rated for either storage or floor loading, vestibules, and/or storage spaces.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-02

INTERNATIONAL RESIDENTIAL CODE

Sections:

4-02-001-0001 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the International Residential Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

CHAPTER 3, IRC, BUILDING PLANNING

Revise the amendment to Section R325, Manufactured Housing Design Requirements, as follows:

> All new manufactured housing (housing classified as modular, factory built or manufactured house) installed within the City of Flagstaff will be designed to meet HUD minimum standards. The City of Flagstaff enforces a 40 pounds per square foot roof snow load for site built construction. HUD standards for snow winter areas in Arizona is not consistent with local conditions and owners should be aware of the differences.
>
> For "used" manufactured housing or "resale"/relocated manufactured housing being brought into the City of Flagstaff, the following applies. As per direction from the State of Arizona, Office of Manufactured Housing, A.R.S. Title 41, specifically requires that all manufactured housing units be certified to meet the minimum standards of the United States Department of Housing and Urban Development and are to be designed in accordance with consistent State of Arizona Standards for manufactured homes and related industries. An applicant requesting an installation permit and inspection will be required to provide proof to the Building Official of the current State certification or re-certification of the unit.
>
> (Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

CHAPTER 4, IRC, FOUNDATIONS

Revise the amendment to Section Amend R401.4.1 as follows:

> All new residential subdivisions require a geotechnical soils report be prepared with foundation recommendations. In established areas of the City of Flagstaff, "in-fill" or vacant lots in subdivisions established prior to 1996, the designer may use 1500 pounds per square foot. Where the Building Official determines that in-place soils with an allowable bearing capacity of less than 1500 pounds per square foot (psf) are likely to be present at

the site, then allowable bearing capacity shall be determined by a geotechnical investigation at the expense of the permit applicant.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011))

Amend R403.1 by adding:

All footings located less than 18 inches (457 mm) below existing grade to be air entrained, 3,500 psi concrete (severe weather), and pinned to rock at intervals specified for foundation wall vertical reinforcements or as specified by the Arizona design professional.

Revise the amendment to R403.1.1 by deleting the following language:

Spread footings shall be at least 8 inches (204 mm) in thickness. Footing projections, *P*, shall be at least 4 inches (102 mm) and shall not exceed the thickness of the footing.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011))

Amend R403.1.2 and R403.1.3 by adding:

Add Seismic "C" category to both sections at all seismic D1 and D2 locations.

Amend R403.1.3 by deleting the exception.

Amend Table R403.1 by changing:

All references to 1,500 and 2,000 psf Load Bearing columns shall be changed from 12 inch (305 mm) and 15 inch (383 mm) minimum width of concrete or masonry footings to 16 inch (408 mm) minimum width for one and two story convention light-frame construction and one story under 4-inch brick veneer and 8-inch solid or fully grouted masonry structures.

Delete R403.1.3.1 in its entirety and add the following language to the replacement amendment:

Foundations with stem-walls shall be provided with a minimum of one No. 4 bar at the top of the wall and two No. 4 bar at the bottom of the footings equally spaced.

Exception: Footing designs without reinforcing steel must be "sealed" by a certified or registered Design Professional.

Delete Section R403.3 in its entirety.

Amend R404.1.1; R404.1.2; R404.1.4, R404.1.8 by adding:

Add Seismic Design Category "C" to all references of D1 and D2.

Amend R404.1.4, Number 1 by deleting "in the upper 12 inches of the wall" and adding:

1. Minimum reinforcement shall consist of one No. 4 horizontal rebar located at top of wall not more than 5 inches (128 mm) below the finished concrete and at the top course of concrete masonry unit walls within close proximity to the anchor bolts.

Amend R404.1.4, second paragraph by changing:

Change the vertical reinforcement bar reference from #3 rebar to #4 rebar.

Amend R407.3 Exception by deleting:

Delete Seismic Design Category "C" from this exception.

CHAPTER 6, IRC, WALL CONSTRUCTION

Amend R602.5 by adding:

Ladder backing shall be spaced a maximum 8 inches (204 mm) on center.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011))

CHAPTER 9, IRC, ROOF ASSEMBLIES

Revise the amendment to Section R904.2 as follows:

All roofing materials used must be a class "A" or "B" and rolled roofing is to be a Class A or B material and shall be a self-adhering, polymer modified bitumen material.

(Amended Ord. No. 2011-12, (July 19, 2011))

Delete Sections R905.7 and R905.8 in their entirety.

CHAPTER 11, IRC, ENERGY EFFICIENCY

Amend Section 1102.1 by adding:

Section N1102.1.1. Insulation values in 2x6 wall construction will remain the same at R-19. Insulation values in 2x4 wall construction will remain at R-15 (high density). Construction using Structural Insulated Panels (SIPS) and/or straw bail in-fill methods will be a minimum of R-21 (industry standards often show results of R-30 to R-45 depending upon materials and thickness of the wall).

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Section N1102.1.2 by adding:

Section N1102.1.2.1. All new construction and replacement windows to have National Fenestration Rating Council (NFRC) total unit U-factor of 0.45 or less. Windows shall also be low-E where practical (not

recommended for southern exposures) or not being used for solar heat gain to fuel a solar massing device.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Section N1103 by adding:

Section N1103.7 Furnaces: All furnaces installed in new construction shall be 90% condensing type furnaces.

Exception: Replacement furnaces are to be voluntary 90% condensing type furnaces.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Chapter 11 by adding the following sections:

Section N1104.1. Water heaters must be insulated using exterior "jackets" or for "Energy Star" or energy conservation rated appliances. The insulation information must be available on the appliance installed at the time of final inspection. A minimum total insulation value of R-16 must be achieved. This applies to new installation or replacements.

Exception: The R-16 is not required for the water heater when the existing room size prohibits the larger sized water heater and when the manufacturer's listing prohibits the use of insulation jackets.

Section N1104.2. A carbon monoxide (CO) detector will be installed at the house/garage entry door and/or within each utility room where combustion appliances are used (sealed combustion appliances are exempt). A laundry room which uses gas appliances would require a detector.

Section N1104.3. All hot water supply lines (both ½: and ¾") will be insulated with a minimum of R3.6 wrap insulation or ½" foam covers. All joints between sections of insulation will be snuggly butted together and wrapped with duct tape.

Section N1104.4. All new construction and replacement heating units (optional for hydronic in-floor heating systems) will have programmable thermostats.

Section N1104.5. All newly installed toilets must be "high efficiency toilets (HET)" units which have a maximum of 1.3 gallons for solids. (Special attention to this change needs to be addressed by suppliers and home improvement centers which stock the older style units).

Section N1104.6. A construction waste reduction/reuse plan will be written and provided at the time of building permit submittal for new construction of all new commercial projects (apartments and condominiums), townhouse subdivisions and or single family detached builders who submit for more than 15 permits within a subdivision during any one calendar year. The plan must address construction waste to include cardboard, drywall, foam, metal, concrete, masonry and asphalt.

Section N1104.7. All appliances, refrigerators, freezers, washers, dryers, cook stoves, that are supplied by the contractor shall be Energy Star rated.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Chapter 11 as follows

Section N1105, Voluntary Best Practices

Section N1105.1: *Future Solar Water Heater.* All new residential construction shall be built so as to accommodate a future installation of a solar water tank. Ceilings within the water heater compartment shall be a minimum 8 foot in height. Either insulated plumbing for standard inter-connect to a roof mounted system will be pre-plumbed or adequately sized chase/access panel provided between the water heater compartment and the attic space will be installed.

Exception: Single story single family dwellings.

Section N1105.2: *Future Solar Photovoltaic.* All new residential construction shall be supplied with a minimum ¾ inch electrical conduit, with a pull wire, for the future installation of a solar photovoltaic system. The conduit shall be run from the inside of an accessible attic crawl space to the electrical service entrance section.

Section N1105.3: *Future Alternative Energy Systems. (Wind Turbines or geo-thermal):* Working drawings prepared by the owner builder, contractor, draftsperson or design professional should indicate possible location of expansion to accept alternative energy systems. This can be demonstration by indicating location of future accessory service panels for electrical systems or expansion capability of mechanical rooms for boilers and control systems.

Section N1105.4: *Voluntary Sustainability Programs.* This allows the voluntary use of LEED, Coconino county sustainable checklist, National Green Building Standard, NAHB 2008, ICC 700-2008. This allows the builder or property owner to participate in sustainable programs that are not listed in the International Energy Conservation Code, 2009 edition.

Section N1105.5: *Jump Ducts.* Provide an air balancing device between adjoining rooms to allow equalization of air pressure and temperatures between rooms.

Section N1105.6: *Exterior Wall Insulation*. Contractor to increase R-19 to R-24 insulation using high density or spray applied foam insulation in exterior framed walls.

Section N1105.7: *Protection of cold water supply lines.* Add R-19 insulation to water supply lines that are exposed in crawl spaces.

Section N1105.6: At the time of final inspection, the builder, contractor, or owner may install compact fluorescent lights (CFLs), other fluorescent, LEDs or other energy efficient lighting equivalent to or better than

fluorescents in the high use areas for new construction. High use areas are typically defined as kitchens, living room, family room, and dining area. Specialty type lighting fixtures shall be of a low wattage or low voltage type.

Exception: Specialty lighting (chandeliers and under counter halogen lights) may be used in living rooms, dining rooms and kitchens. Recessed spot lights will use CFL's or LED's and reostats must be rated for their use.

Section N1105.7 Wood floors in new construction may have an insulation value of R-30.

Section N1105.8 Insulation in contact with the ground may be extruded polystyrene of other foam products other than expanded polystyrene.

Section N1105.9 Hot water re-circulating pumps are to have a programmable timer, an on/off switch, and ¾ inch foam pipe insulation.

Section N1105.10 Dual Plumbing. All new residential single family detached units are "voluntarily" requested to install the piping only for dual plumbed for "gray water" disposal and conservation efforts. Access for future valving must be provided. The initial installation will be connected to sanitary sewer. The piping shall be installed in accordance Appendix C, Gray Water Recycling Systems, of the International Plumbing Code, 2009 Edition, and the regulations established by ADEQ. Reference Type 1 General Permit Best Management Practices for the 13 points of using gray water, at www.adeq.state.az.us or call at 1-800-234-5677.)

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

CHAPTER 13 IRC, GENERAL MECHANICAL

Revise the amendments to Section M1305.1.4.3 by adding the following language:

"Furnaces are to be hard-wired (no cord & cap unless specifically supplied by the manufacturer) with a 20 ampere motor rated disconnect within sight of the furnace."

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

Revise the amendment to Section M1307.3.1 to read:

See G2408.3 for appliance protection.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

CHAPTER 24, IRC, FUEL GAS

Amend Section G2406.2 by deleting numbers 3 and 4.

Change the amendment to Section G2408.3 to read as follows:

> Appliances shall not be located in a location where subject to mechanical damage unless protected by approved barriers such as steel bollards filled with concrete, poured in place concrete curb, or installed wheel stops, or on a platform with a minimum clearance of 24 inches (460 mm) above the floor. Appliances not subject to mechanical damage shall be installed per Section 305.3 The exception is deleted in its entirety.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

Change the amendments to Sections G2417.4.1 and G2417.4.2 by making the following revisions:

> The test pressure shall be 10 psi (or half the maximum of the gauge) for a period of 15 minutes. Gauges shall be of 1/10 pound increments or less and shall have a pressure range no greater than twice the test pressure.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

In Section G2439.4 (614.5), Makeup Air, change the amendment to read as follows:

> Installations exhausting more than 200 cfm (o.09 m3/s) shall be provided with makeup air. (Amended Ord. No. 2011-12, (July 19, 2011)

CHAPTER 26, IRC, GENERAL PLUMBING REQUIREMENTS

Revise the amendment to Section P2603.6.1 to read as follows:

> Building sewers that connect to private sewage disposal systems must be approved by the Coconino Country Environmental Health Department Building sewers for single family detached buildings shall be a minimum of 12 inches (306 mm) below grade.

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

CHAPTER 31, IRC, VENTS

Revise the amendment to Section P3101.1, Roof Extension, to read as follows:

> Add "12 inches (306 mm) above the roof."

(Amended, Ord. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, (July 19, 2011)

INTERNATIONAL RESIDENTIAL CODES (IRC), 2006 EDITION, PART X – APPENDICES

Revise the amendments to Part X – Appendices as follows:

APPENDIX F – Radon Control Methods

APPENDIX G – Swimming Pools, Spas and Hot Tubs

APPENDIX H – Patio Covers

APPENDIX J – Existing Building and Structures.

APPENDIX M - Home Day Care, R-3 Occupancy (a home occupation permit is required prior to receiving any building permits for conversions or improvements).

APPENDIX O – Gray Water Recycling Systems (cross reference to Chapter 11 and timing for implementation. Applicant must also meet the requirements of ADEQ if systems are larger than what the State of Arizona allows).

APPENDIX R – Straw Bale construction guide for residential use.

Section AR101 TITLE, SCOPE and PURPOSE

AR101.1 Title. These provisions shall be known as the City of Flagstaff Straw Bale Construction Code.

AR101.2 Scope. This appendix shall govern the use of baled straw as a building material, and shall apply to Group R occupancies, Group U occupancies and other occupancies when secondary and appurtenant to Group R or Group U occupancies. Unless stated otherwise in this appendix, all other provisions in this code shall apply to structures using baled straw as a building material.

AR101.3 Purpose. The purpose of this appendix is to provide minimum requirements specific to an alternative building materials, reference Section R104.11 and associated testing in Section R104.11.1 Tests, with regards to using straw bale as a building material. With the provisions of this appendix, straw bales may be used as a structural or non-structural material. Structural uses include elements designed to support gravity loads, and elements design to resist in-plane wind and seismic loads. Non-structural uses include, but are not limited to, infill walls, insulation, landscape walls and benches.

AR101.3.1 Current test studies done Bou-Ali, Ghailene (1993), University of Arizona, Tucson; Ruppert, Grandsaet (1999), University of Colorado, Boulder; show that structurally bearing elements of straw bale are limited to between 300 - 800 pounds per linear foot depending upon the wall plaster used. The CBC also limits the walls to 20 PSF snow live loads.

AR101.3.2. For Flagstaff, with a 40 PSF snow load, the bearing capacity shall be limited to 150 – 400 pounds per linear foot. No floor loading will be allowed on straw bale walls without structural engineering.

AR101.3.3. Trusses roof spans are limited to fifteen (15) feet in width and top plates and anchoring for uplift must be provided. All other spans or sections of a house which would be two story or more must us a structural "space" frame or post and beam method. In these designs, the straw bale is being used as infill for insulation value.

Section AR102 DEFINITIONS

AR102.1 General. The following words and terms shall, for the purposes of this appendix, have the meanings shown here. Refer to Chapter 2 for general definitions used elsewhere in the International Residential Code.

Bale. Equivalent to "straw bale" for the purposes of this appendix.

Bending. A moment (force) acting on a body will induce bending stress.

Bond. The measure of adhesion; i.e., the bond of concrete or stabilized earth to reinforcing bars and anchor bolts.

Bond Beam. A structural element within a wall (usually at the top) intended to stabilize the wall and facilitate the transfer of loads from above.

Buckling. The collapse of a wall or column by bending and breaking under a vertical load.

Flake. A slab or straw removed from an untied bale. In particular, an intact slab (3-5" thick) as created by the baling machine.

Laid flat. Stacking bales so the sides and the largest area are horizontal and the longest dimension of this area is parallel with the wall plane.

Laid On-Edge. Stacking bales so the sides with the largest area are vertical and the longest dimension of this area is horizontal and parallel with the wall plane.

Mesh. An openwork fabric of linked strands of metal, plastic or natural fiber, embedded in plaster to provide tensile reinforcement and/or bonding. (also sometimes lath).

Moisture Barrier. A continuous barrier capable of stopping the passage of water.

Non-Load-bearing. (See Non-Structural.)

Non-Structural. A straw bale wall or other element which supports only its own weight, and may resist out-of-plane lateral loads.

Pins. Metal rod, wooden dowel or bamboo driven into or secured on the surface of stacked bales for purposes of connection or stability.

Plaster. Gypsum, lime, lime-Cement, or cement plasters, as defined by the code and Section AR106 of this appendix, or clay plaster and earth-cement plaster as defined in Section AR106.9 and AR106.10.

Running Bond. The placement of straw bales such that the head joints in successive courses are offset at least one quarter of the bale length below.

Skin. The compilation of plaster and reinforcing, if any, on the surface of stacked bales.

Structural. A straw bale wall or other element which support gravity loads (dead and live) and/or resists in-plane lateral loads.

Stack Bond. The placement of straw bales such that head joints in successive courses are vertically aligned (similar to the "soldier" courses in masonry construction).

Straw. The dry stems of cereal grains left after the seed heads have been substantially removed.

Straw Bale. A rectangular compressed block of straw, bound by polypropylene strings or baling wire.

Straw-bale. The adjective form of straw bale.

Straw-clay. A mix of loose straw and clay binder.

Three-String Bale. A straw bale bound by three strings or wires. Typically with approximate dimensions of 15"x23"x42" to 48" long.

Truth Window. An area of a straw-bale wall left without its finish, to allow view of the straw otherwise concealed by its finish.

Two-String Bale. A Straw bale found by two strings or wires. Typically wit approximate dimensions of 16" or 14" x 18" x 36" to 45" long.

Vapor-Permeable Membrane. A material or covering having a permeance rating of five (5) perms or grater, when testing in accordance with the desiccant method using Procedure A of ASTM E96. A vapor-permeable material permits the passage of moisture. (This definition is shown for convenience and is identical to that shown in Chapter 2, 2006 IBC.)

Vapor Retarder. A vapor-resistant material, membrane or covering such as foil, plastic sheeting or insulation facing having a permeance rating of one (1) perm or less, when tested in accordance with the desiccant method using Procedure A or ASTM E96. Vapor retarders limit the amount of moisture vapor that passes through material or wall assembly. (This definition is shown for convenience and is identical to that shown in Chapter 2, 2006 IBC.)

Section AR103 BALES

AR103.1. Bales Shall Be Rectangular In Shape. The use of non-rectangular bales, such as circular bales, shall not be used in structural applications.

AR103.2 Size. Bales used with a continuous wall shall be of consistent height and width to ensure even distribution of loads with the wall system.

AR103.3 Ties. Bales shall be bound with ties of polypropylene string or baling wire. Bales with broken or loose ties shall be firmly retied. A visual check by the assigned field inspector of materials delivered to the job site will be done prior to assembly of bale walls.

AR103.4 Moisture Content. The moisture content of bales, at the time of procurement and at the time of application of the first coat of plaster or installation of another weather protective finish, shall not exceed nineteen (19%) percent of the total weight of the bale (ideal moisture content would be the same as kiln dried wood, between 15-17%). The moisture content of bales shall be determined by use of a moisture meter designed for use with baled straw or hay, equipped with a probe of sufficient length to reach the center of the bale. A minimum of five bales, selected by the inspector at random will be tested.

AR103.5 Density. Bales shall have a minimum dry density of 6 pounds per cubic foot. The dry density shall be determined by reducing the actual bale weight by the weight of the moisture content in pounds, and dividing by the volume of the bale in cubic feet. At least five bales and not less than two (2) percent, randomly selected from the bales to be used, may be tested to determine if all of the bales for the building are of acceptable density. This inspection will be done at the same time as the moisture content is done. If equipment is not available, then the builder may elect to use a third party or special inspection to perform the testing.

AR103.6 Partial Bales. Custom-made partial bales shall be firmly retied and where possible, use the same number of ties as the standard size bales.

AR103.7 Types of Straw. Bales of various types of straw, including wheat, rice, rye, barley, oat and similar grain plants, shall be acceptable if they meet the minimum requirements of this Section for density, shape, moisture content and ties. Bales of hay and other grasses containing seed shall not be used as a building material. When securing materials from a supplier, it is practical to remember that straw is for building and hay is for food.

AR103.8 Protection of Bales Prior To Installation. The builder must store the bales in such a manner as to protect them from weather and other sources of moisture damage. Storing bales in direct contact with the earth or uncovered during inclement weather will be subject to rejection by the building inspector.

AR103.9 Unacceptable Bales. Bales which show signs of damage due to moisture, including but not limited to mold or fungus growth or associated discoloration, even if they are of an acceptable moisture content and density, shall not be used. The builder must inspect all deliveries and protect the bales prior to the installation in the wall frames.

AR103.10 Wall Thickness. Nominal minimum bale wall thickness shall be fourteen (14") inches or greater.

Section AR104 MOISTURE

AR104.1 General. All weather-exposed bale walls, other weather-exposed bale elements and bale walls enclosing showers or steam rooms shall be protected from water damage.

AR104.2 MOISTURE CONTENT of BALES (See definitions, Section AR103.4).

AR104.3 Moisture Barriers and Vapor Retarders. Plastered bale walls may be constructed without any membrane barrier between straw and plaster, except as required elsewhere in this appendix. This is allowed to facilitate transpiration of moisture from the bales and to secure a structural bond between straw and plaster. No vapor permeance rating of less than 5 perms, except as permitted elsewhere in this appendix, or as demonstrated to be necessary by a design professional of record (this must be an Arizona Registered Architect or Engineer in accordance with ARS 32-121)shall be used.

AR104.4 Horizontal Surfaces. Bale walls and other bale elements shall have a moisture barrier at all horizontal surfaces exposed to the weather. This moisture barrier shall be of a material and installation that will prevent water from entering the wall system or other bale elements.

AR104.4.1 These horizontal surfaces include, but are not limited to exterior window sills, sills at exterior niches, bale vaults and arches, tops of landscape walls and weather-exposed benches.

AR104.4.2 The finish material at all "horizontal" surfaces shall be sloped a minimum of one inch per foot (8%) and shall drain beyond and away from all bale walls or bale elements. If the moisture barrier is below the finish material, it shall be sloped a minimum of one inch per foot (8%) and shall drain beyond the outside vertical surface of the bale's vertical finish.

AR104.4.3 In areas where snow may collect, the moisture barrier and/or flashing element may have to be extended upwards on the vertical surface to prevent damage to the bale(s).

AR104.5 *Parapets – Prohibited Construction*. Parapets made of straw bales are prohibited. The roof over-hang must always extend over the top of the straw bale walls.

AR104.6 Bale/Concrete Separation. There shall be a moisture barrier and a capillary break between bales and support concrete. The moisture

barrier may be of any durable sheet or liquid applied membrane that is impervious to water. The capillary break may be any material that prevents the "wicking" of moisture across the material and into the bale(s). Where bales abut a concrete or masonry wall that retains earth, there shall be a moisture barrier between the wall and the bales.

AR104.7 No Plumbing Trees Will Be Allowed in Straw Bale Walls. Conventional framed walls will be provided. Plumbing will not be installed in interior non-load bearing straw bale walls. The use of wood framed "false" walls or furred out sections in front of walls will be allowed.

AR104.7.1 *Exception*: Hose bibs will be allowed to penetrate a straw bale exterior wall as long as the plumbing is sleeved and the bib/sleeve extends a minimum of six (6")inches beyond the exterior/interior surfaces of the wall.

Section AR105 STRUCTURAL USE OF STRAWBALE

AR105.1 Scope. Buildings constructed with straw bales shall comply with this Section, and with all other structural provisions of the International Residential Code, 2006 Edition, Chapters 4, 5, 6 (as it pertains to those areas of a straw bale structure which is conventionally framed) and 8, unless stated otherwise in this appendix. The design considerations for Flagstaff, Arizona is found in Table R301.2(1) as amended in Title 4, City Codes, City of Flagstaff 2011 Building Code Amendments.,
AR105.1.1 Energy Considerations. The use of straw bale construction may enable the builder to meet or surpass many of the requirements of the International Energy Conservation Code (IECC).

AR105.2 General. Straw bale buildings may use any type of structural system allowed by this code and this appendix.

AR105.3 Foundations. Foundations for straw bale walls and other straw bale elements may be of any foundation type permitted by this code and amendments thereto. The frost depth requirements remain the same at 30" below finished grade. The amount of steel will remain the same at two (2), #4 rebar laid continuously at the bottom of the footing (three inches above the bottom of the footing). The straw bales may not be buried below finished grade and the first row must be placed a minimum of six (6) inches above the finished grade on a concrete slab (see detail).

AR105.4. Alternative Foundations. Alternate foundations and foundation systems may be used if designed by an Arizona Registered design professional (Architect or Engineer).

AR105.6 Configuration of Bales. Bales may be laid flat or on-edge as limited in height by AR105.5. Bales in walls with reinforced plasters may be a running or stack bond. Bales in walls with un-reinforced plaster shall be in a running bond only.

AR105.7 Pre-Compression of Straw bale Walls.

AR105.7.1 When not required:

AR105.7.1.1. For non-structural walls

AR105.7.1.2. For walls designed or allowed to resist lateral forces only.

AR105.7.1.3. For walls bearing gravity roof loads, when the full dead load of the roof is imposed and remains on the wall for at least 28 days before plastering. No design snow load greater than 40 psf is allowed (see restrictions on spans in Section AR101.3.3). No floor loads may be supported by walls which are not pre-compressed.

AR105.7.2 When required. All walls bearing gravity loads, which are not described in AR105.6.1, shall be pre-compressed to a force equal to or greater than the design loads on the wall.

AR105.8 Voids and Stuffing. Voids in the field of structural straw bale walls shall be limited to six (6) inches in width and shall be firmly stuffed with flakes of straw or with straw-clay, before the application of plaster.

AR105.9 PLASTER SKINS.

AR105.9.1 General. Plaster skins on structural walls may be of any type allowed in Section AR106, except gypsum plaster, and shall also be limited by Table AR105-A and Table AR105-B.

AR105.9.2 Straightness. On structural walls (load bearing), plaster skins shall be straight as a function of the bale wall surface they are applied to as follows:

AR105.9.2.1. Across the face of the bale – straw bulges shall not protrude more than ¾" across two feet of its height or length.

AR105.9.2.2 Across the face of a bale wall – straw bulges shall not protrude from the vertical plane of the bale wall more than 2-1/2" over eight (8) feet.

AR105.9.2.3 Offset of bales – the vertical face of adjacent bales may not be offset more than ¾".

AR105.9.3 Plaster and Membranes. Structural bale walls shall have no membrane between straw and plaster; or shall have sufficient attachment through the bale wall from one plaster skin to the other as designed by an Arizona Registered design professional (Architect or Engineer). See sections AR106.5 and AR106.6.

AR105.10 Transfer of Loads into Plaster Skins. When plastered straw bale walls are used to bear gravity and/or lateral loads, such loads shall be transferred into the plaster skins by direct bearing or by other adequate transfer mechanism (alternatives must be provided to the Building Official for approval).

AR105.11 SUPPORT of PLASTER SKINS.

AR105.11.1 For Structural Walls. Plaster skins for structural straw-bale walls shall be continuously supported along their bottom edge to allow a load path into the foundation system. Acceptable supports include, but are not limited to: concrete or masonry footings, concrete slab, wood framed flooring which is adequately blocked for the width of the imposing load, wood beam or steel angle adequately anchored for the imposed weight of the plaster skin.

AR105.11.2 For Non-Structural Walls. Plaster skins for non-structural walls need not to be supported along their bottom edge. Maximum length of walls without cross bracing (either straw bale or conventional framing is twenty (20) feet.

TABLE AR105-A
Allowable gravity Loads (pounds per foot)
for plastered Straw bale walls (18-23" width)

WALL PLASTER[a]	SILL PLATES[bc]	Anchor, Bolts or Other Sill Fastening[c]	Mesh[d]	Staples	Allowable Bearing Capacity[h]
A. Clay	c	c	None P	None P	300
B. Soil-Cement[k]	c	c	d	e,f,g	800
C. Lime	c	c	d	e,f,g	450
D. Cement-line	c	c	d	e,f,g	800
E. Portland Cement[I]	c	c	d	e,f,g	800

[a] Plasters shall conform with AR106.9 through AR106.11.2.3 for makeup and thickness with AR10.92 for straightness and with AR105.11.1 and AR105.11.2 for support of plaster skins.

[b] Sill plates shall support and be flush with each face of the bale wall.

[c] For walls supporting gravity loads only (or for non-structural walls), use sill plates and fasteners as required for framed walls in 2308.2 and 2308.3. See table AR 105-B for requirements for shear walls and braced panel walls.

[d] May be any metal mesh allowed by this code and must be installed throughout the plaster with minimum four (4") inch laps. Fasten with staples per footnote "e". Staples shall be at maximum spacing of two (2") inches o.c. to roof or floor bearing assembly, or as shown necessary to transfer loads into the plaster skins per AR105.10 and at a maximum spacing of four (4") inches o.c. to sill plates.

[e] Staples shall be gun staples (stainless steel or electro-galvanized, 16 gauge with 1-1/4" legs, 7/16" crown) or manually driven staples (galvanized 15 gauge with 7/8" legs, 3/16" inner spread and rounded shoulder). Other staples may be used as designed by an Arizona Registered design professional.

[f] Staples shall be firmly driven, diagonally across mesh intersections at spacing indicated. For walls with a different plaster on each side, use the lower value.

[g] For walls with a different plaster on each side, use the lower value.

[I] Minimum 1-1/2" thickness. Building Official may require a compression test to demonstrate a minimum 100 psi compressive strength.

[i] Except as necessary to transfer roof or floor loads into the plaster skins per AR105.10.

[j] Minimum 1-1/2" thickness. Building official may require a compression test to demonstrate a minimum 1000 psi compressive strength.

[k] Containing lime as described in AR106.11

Table AR105-B
Allowable Shear (pounds per foot) for Plastered straw bale walls
(18" and 23" inch think)

Wall	Plaster[a] (both sides)	Sill Plates[b]	Anchor[c] Bolts (on center)	Mesh[d]	Staples[efg] (on center)	Allowable Shear[hi]
A1	Clay[i]	2x4	2'8"	None	None	100
A2	Clay[i]	2x4	2'8"	3"x3" knotted hemp	3"	120
A3	Clay[g]	4x4	2"0"	2"x2" high-density polypropylene	2"	180
B	soil-cement[i]	4x4	2"0"	2"x2" 14 ga[k]	2"	300
C1	lime	2x4	2'8"	17 ga. Woven wire	2"	200
C2	lime	4x4	2'0"	2"x2" 14 ga[k]	2"	250
D1	cement-lime	4x4	2'8"	17 ga. Woven wire	2"	400
D2	cement-lime	4x4	2'0"	2"x2" 14 ga[k]	2"	450

[a] Plasters shall conform with AR106.9 through AR106.11.2.3 for makeup and thickness, with AR105.9.2 for straightness and with AR105.11 for support of plaster skins.

[b] Sill plates shall be pressure treated or foundation red wood.

[c] Anchor bolts shall be ½" diameter with washers with a minimum seven (7") inch embedment in the concrete foundation.

AR105.11.2 Resistance to out-of-plane lateral loads. Plastered straw bale walls are capable of withstanding out-of-plane design loads prescribed in this code with the following limitations:

AR105.11.2.1. Walls with reinforced plasters shall be limited by a 6:1 ratio of stacked bale height to bale width per AR105.5 (this limits the

23 inch wide bale to 11'-6" in height and 18" inch wide bales to 9' in height).

AR105.11.2.2 Walls with un-reinforced plasters shall be limited by a 4:1 ratio of stacked bale height to bale width (this limits the 23 inch wide bale to 7'-8" and the 18" inch wide bales to 6' in height). Walls may not be built using the overall length of the bale (often 36 to 48" in length to increase the height). An exception can be made for custom made bales is the ratios of height, width and length are maintained. Regardless, no straw bale walls will be allowed to be greater than fourteen (14') feet in height without (1) being engineered by an Arizona Registered design professional or (2) being part of a post and beam structure in which the straw bales are only used as in-fill.

AR105.11.2.3 Wall with un-reinforced plasters or no plaster, and with internal or external pins, shall be limited by a 6:1 ratio of stacked bale height to bale width. Pins may be ½" diameter steel (# 4 rebar), wood or bamboo. Internal pins shall be installed vertically at a maximum of two (2') foot spacing into the bales from the top course to bottom course, with the bottom course being connected to its support similarly with pins or other approved means. Pins may be continuous or may overlap through one bale course. External pins shall have full lateral bearing on the sill plate and the roof or floor bearing member and shall be tightly tied though the wall to an opposing pin with polypropylene string or bailing wire at a thirty (30") inch maximum spacing.

AR105.11.3 PRESCRIPTIVE DESIGN USING STRUCTURAL STRAW BALE WALLS.

AR105.11.3.1 General. Plastered straw bale walls may be used structurally, without design by an Arizona design professional (Architect or Engineer), as described in this subsection. Such walls shall also comply with AR105.5 through AR 105.11.2.3 of this Section and shall comply with other Sections of this appendix as applicable.

AR105.11.3.2 Load and Other Limitations. As described in 2308.2-3 through 7, and 2308.2.2.

AR105.11.3.3 Gravity Load Bearing Walls. Limited to wall types B, C, D and E, shown in Table AR105-A. Type A walls may be used if they are demonstrated to support design loads no greater than the allowable load.

AR105.3.4 Braced panels. Straw bale shear walls may be used as braced panels per the requirements and limitations in IBC Section 2308.9.3 Bracing, and per IBC Section 2308.12. Additional requirements for conventional construction in Seismic Design Category C. Straw bale shear wall types B, C, D and E shown in Table AR105-B may be used in situations where braced wall panel types 2, 3, 4, 6 and 7 are allowed. Straw bale shear wall type A may be used in situations where braced wall panels types 1 and 5 are allowed.

AR105.12 Connection of Framed Walls to Straw bale Walls. Framed walls perpendicular to or at an angle to a straw bale wall assembly, need only be fastened to the bottom and top wood members of the straw bale wall per framing connections permissible in this code. Where such connection

is not possible, the abutting stud shall be connected to alternating straw bale courses with a ½" diameter steel (#4 rebar), wood or bamboo dowel with minimum of eight (8") penetration into the straw bale.

AR105.13 Alternate Performance Design Criteria (must provide structural calculations and be stamped by an Arizona Registered design professional). When plastered straw bale walls or other elements are engineered, they may use the model of retained, thin shell, reinforced concrete, as in the American Concrete Institute's ACI-318 Manual. This model may be used for all reinforced plasters, including those without cement. Such design and analysis shall be made in accordance with the following:

AR105.13.1 General. Straw bale structural systems and elements shall be designed using engineering principles, fundamental engineering behavior and principles of mechanics.

AR105.13.2 Rationality. Straw bale structural elements shall be designed based on a rational analysis in accordance with established principles of mechanics. These elements shall provide a complete load path capable of transferring all loads and forces from their point of origin to the load-resisting elements based on a rational connection of components.

AR105.13.3 System Characteristics. Strength, stiffness and toughness (ductility) characteristics or the bales and their skins shall be considered in the design of the system.

Section AR 106 FINISHES

AR106.1 General. Finishes applied to straw bale walls may be of any type permitted by this code and shall comply with this Section and the provisions of Chapter 14 (Exterior Walls, 2006 IBC) and Chapter 25 (Gypsum Board and Plaster, 2006 IBC) unless stated otherwise in this Section.

AR106.2 Purpose and Where Required. Straw bale walls and other straw bale elements shall be finished so as to provide mechanical and fire protection of the bales, restrict the passage of air through the bales and to protect them from weather.

AR106.3 Vapor Retarders. No vapor retarder may be used on a bale wall, nor shall any other materials be used which has a vapor permeance rating of less than 5 perms; except as permitted elsewhere in this appendix or as demonstrated to be necessary by an Arizona Registered design professional (Architect or Engineer).

AR106.4 Plaster. Plaster applied to bales may be of any type described in this section.

AR106.5 Plaster and Membranes. Plaster may be applied directly to straw bale walls and other straw bale elements, in order to facilitate transpiration of moisture from the bales and to secure a mechanical bond between the skin and the bales; except where a membrane is allowed or required elsewhere in this appendix. Structural bale walls shall have

no membrane between straw and plaster or shall have sufficient attachment through the bale wall from one plaster skin to the other, as designed by an Arizona Registered design professional (Architect or Engineer).

AR106.6 Lath and Mesh for Plaster. In straw bale construction the surface of the straw bales functions as lath and no other lath or mesh is necessary; except as required for tensile strength of the plaster and/or wall assembly in particular structural applications (see AR105). Straw bales laid flat or on-edge provide a sufficient mechanical bonding surface between plaster and straw.

AR106.7 Plaster on Non-Structural Walls. Plaster on walls that do not carry gravity loads and are not designed to resist in-plane lateral forces, may be any plaster as described in this Section.

AR106.8 Plaster on Structural Walls. Plaster on structural walls shall comply with AR105.9 through AR105.11. Plaster on walls that carry gravity loads shall comply with Table AR105-A. Plaster on walls designed to resist in-plain lateral forces, shall comply with Table AR105-B.

AR106.9 Clay Plaster (Also known commonly as earth or earthen plaster).

AR106.9.1 General. Clay plaster is any plaster whose binder is comprised primarily of clay. Clay plasters may also contain sand or other inert granular material and may contain reinforcing fibers. Acceptable reinforcing fibers include, but are not limited to, chopped straw, hemp fiber, nylon fiber and animal hair.

AR106.9.2 Mesh. Clay plaster may have no mesh.
Exception: A natural fiber mesh, corrosion-resistant metal mesh or high-density polypropylene mesh may be used.

AR106.9.3 Thickness. Clay plaster shall be a minimum one (1") inch thick, unless required to be thicker for structural or fire-resistance as described in this appendix.

AR106.9.4 Rain-Exposed. Clay plaster, where exposed to rain (snow) shall be finished with lime plaster or other erosion resistant finish.

AR106.9.5 Prohibited Finish Coat. Cement plaster and cement-lime plaster are prohibited as a finish coat over clay plasters.

AR106.9.6 Additives. Additives may be used to increase the plasters workability, durability, strength or water resistance.

AR106.9.7 Separation of Wood and Clay Plaster. No separation or moisture barrier is required between untreated wood and clay plaster. (Wood, earth and foundation separation requirements are still enforced and covered in Section R319 and R403 of 2006 IRC).

AR106.10 Earth-Cement Plaster (also know commonly as soil-cement, stabilized earth or pise').

AR106.10.1 General. Earth-cement plaster is comprised of earth (free or organic matter), Portland cement and may include sand or other inert granular material. May contain reinforcing fibers.

AR106.10.2 Mesh. Earth-cement plaster shall use any corrosive-resistant metal mesh permitted by this code and as described in Section AR105 if used on a structural wall.

AR106.10.3 Thickness. Earth-cement plaster shall be a minimum of 1-1/2" thick.

AR106.11 Gypsum Plaster.

AR106.11.1 General. Gypsum plaster shall comply with Section 2511 of the 2006 IBC.

AR106.11.2 Restriction of Use. Gypsum plaster is limited to use on interior surfaces and on non-structural walls, except as a finish coat over an allowed structural plaster.

AR106.12 Lime Plaster.

AR106.12.1 General. Lime plaster is any plaster whose binder is comprised primarily of calcium hydroxide (CaOH). This includes Type N or Type S hydrated lime, natural hydraulic lime or quicklime. Lime plasters shall comply with ASTM Standards C5 and C206. The plaster may be applied in two coats, provided that the combined thickness is a least 7/8" thick and each coat is not great than 5/8" thick. The combined thickness of all plaster coats (regardless of numbers) shall be no more than 1-1/2" thick.

AR106.13. Cement-Lime Plaster.

AR106.13.1. General. Cement-lime plaster shall comply with Section 2508 of the 2006 IBC, except that the plaster may be applied in two (2) coats, provided that the combined thickness is at least 7/8" thick and each coat is no greater than 5/8" thick.

AR 106.14 Portland Cement Plaster.

AR106.14.1 General. Portland cement plaster shall comply with Section 2512 (2006 IBC) of this code, except that the amount of lime in all plaster coats shall be a minimum of one (1) part lime per six (6) parts cement so as to allow a minimum acceptable vapor permeability. The plaster may be applied in two (2) coats, provided that the combined thickness is at least 7/8" thick and each coat is not great than 5/8" thick. The combined thickness of all plaster coats (regardless of numbers) shall be no more than 1-1/2" thick.

AR106.15 Alternative Plasters. Plasters or variations of plasters, which do not fit in any other category described in this Section, may be allowed if such plasters are demonstrated to be appropriate for the particular application. Approval shall be made by the Building Official.

AR106.16. Finishes Over Plaster. Other finishes, as permitted elsewhere in this code, may be applied over the plaster, except as prohibited in Section AR106.17.

AR106.17. Prohibited Plasters and Finishes. Any plaster or finish with a cumulative perm rating of less than 5 perms is prohibited on straw bale walls or other bale elements, unless demonstrated to be necessary by the Arizona Registered design professional (Architect or Engineer).

AR106.18. Separation of Wood and Plaster. Where wood framing or wood sheathing occur in straw bale walls, such wood surfaces shall be separated from any plaster finish with No. 15 asphalt felt, Grade 'D' paper or other approved material per Section 1404.2 of this code, unless the wood is preservative-treated or naturally durable.

Exception: Clay plasters, see Section AR106.9.7

Section AR107 FIRE-RESISTANCE

AR107.1 Fire-Resistance Rating.

AR107.2. Rating with Plaster Finish. Plastered straw bale walls have a one-hour fire resistance rating, provide the components of the wall fit with all of the following parameters:

AR107.2.1 Bales may be laid flat or on-edge.

AR107.2.2 The bale wall must have a minimum un-plastered thickness of fourteen (14") inches.

AR107.2.3. Bales may be installed in a running bond or stack bond, but vertical joints in a stack bond and continuous vertical gaps at any posts within both types of wall, must be fire-stopped with straw-clay

AR107.2.4. The wall must be finished on both sides and exposed ends with a plaster of any type allowed by this appendix. Clay plaster must be a minimum 1-1/2" thick and a minimum of two layers.

AR107.2.5 The wall may be no closer than five (5') to a property line.

AR107.2.6 Rating with other finishes. Straw bale walls covered with finish materials other than or in addition to plaster, shall be deemed to have the equivalent fire resistive rating as wood-frame construction covered with the same finish materials.

AR107.3 Permitted in Types of Construction. Straw bale walls with a one-hour fire resistance rating per Section AR107.2 are permitted wherever combustible one-hour walls are allowed by Chapter 6 of the IBC. Such walls and unrated straw bale walls with any finish allowed by this code are permitted whenever combustible no-hour walls are allowed in Chapter 6 of the IBC.

AR107.4 Openings in Rated Walls. Openings and penetrations in any straw bale wall rated and required to be rated for a particular fire-

resistance rating and for a particular applications, shall satisfy the same requirements for openings and penetrations in walls with the same fire-resistive rating and application as stated elsewhere in this code.

AR107.5 Clearance to Fireplaces and Chimneys. Straw bale surfaces adjacent to fireplaces or chimneys shall have a minimum of 2" clearance from the surfaces of the plaster coat and the chimney structure. The space between can be bridged by non-combustible materials, such as flashing and aluminum or other metal channel materials.

Section AR108 ELECTRICAL

AR108.1 Scope. Wiring and other elements of the electrical system within or mounted to straw bale walls shall comply with all Sections of this code which govern electrical systems and with the 2011 National Electric Code.

AR108.2 Wiring. Type NM or UF cable may be used, or wiring may be in metallic or non-metallic conduit (which is the preferred method). Wiring which is unprotected by conduit shall be installed a minimum of two (2") inches from the face of the bale, except as necessary to enter or exit a junction box. The wiring shall be pushed into joints between bales or into the bale itself or the bales may be channeled to receive the wire.

AR108.3 Wiring Attachment. Where not held securely between bales or within a bale and not attached via staples to a wood member, wiring on straw bale walls shall be attached with minimum 17 gauge wire in a "U" configuration with a minimum eight (8") long legs.

AR108.4 Attachment of Electrical Boxes. Electrical boxes on bale walls shall be securely fastened to non-bale structural elements or to wooden stakes driven a minimum of twelve (12") into the bales or shall be secured by a combination of wire mesh and plaster, or by an acceptable equivalent method.

AR108.5 Attachment of Service and Sub-panels. Electrical service and sub-panels on bale walls shall be securely fastened to wood structural members, or to other wood members that have been adequately fastened to the straw bales. All proposed service panel and sub-panel support members shall be approved by the field inspector prior to attachment. The administrative authority, Arizona Public Service, retains the right to make any adjustments for support requirements and should be contacted prior to installation.

Section AR109 WALL AND ROOF BEARING ASSEMBLY ANCHORAGE AND CONSTRUCTION

AR109.1 General. The following is a recommended construction technique for straw bale construction. A designer or Arizona Registered design professional may submit other proposed methods as long as the general requirements of this Section and the International Building Codes are followed.

AR109.2 Bale interconnection support. Vertical reinforcing bars with a minimum diameter of ½" (#4 rebar), shall be embedded in the foundation

at a minimum depth of six (6") inches and shall extend above the foundation a minimum of twelve (12") for the purpose of impaling the first course of bales. These vertical bars shall be located along the centerline of the bale wall, spaced not more than two (2) feet apart. A vertical bar shall also be located within one (1) foot of any opening (doors or window element) or corner, except at locations occupied by anchor bolts. These pins or bars will be wet set along with the anchor bolts.

AR109.3 Intersecting walls. Wall of other materials intersecting the straw bale walls shall be attached to the bale wall by means of one or more of the following methods or an acceptable equivalent.

(Adopted, Ord. No. 2009-06, 07/17/2009 (Amended Ord. No. 2011-12, (July 19, 2011)

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-03

INTERNATIONAL BUILDING CODE

Sections:

Section 4-03-001-0001 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the International Building Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

Amend IBC Section 105.1.1, Annual permit and Section 105.1.2 by replacing with the following:

> **Section 105.1.1 Annual Facilities Permit Requirements - General.** The Annual Facility Permit is intended to simplify the permitting and inspection process for Qualified Facilities. The Annual Facility Permit simplified the process by allowing City inspectors to review plans without being processed through formal plan review. Instead, it allows the Qualified Agent and /or the Qualified Facility Maintenance Staff member, who are familiar with the construction history of the Qualified Facility, to review work without requiring a standard building permit. The process provides a limited exemption from the Building Code compliance. The Annual Facility Permit is issued to a business owner(s) for one building or a series of related buildings in a single complex owned by the same owner(s). The Annual Facility Permit fee shall be $3,500 initially and $2,000 for the Annual Facility Permit renewal fee. The business owner(s) covered under the Annual Facility Permit shall provide annual certification for the Qualified Agent and shall provide a detailed description of the anticipated work to be performed under the Annual Facility Permit.

Add 105.1.1.1 Definitions: For the purposes of this section, certain terms are defined as follows:

> **INSPECTOR** is a person employed by the City of Flagstaff (either through contractual services or as a full time City employee) to perform field and/or plan review inspections of buildings and structures in order to enforce the City's Building Code requirements.
>
> **PROJECT SCOPE LIMITATIONS** are restrictions on the size of a project for eligibility for the Qualified Facility building permit exemption under an Annual Facility Permit. The exemption eligibility is limited to projects not to exceed $35,000 in construction costs or twenty-five percent (25%) of the existing square footage of the structures.
>
> **QUALIFIED FACILITY MAINTENANCE STAFF MEMBER** is a person(s) either employed by or contracted with the Qualified Facility owner(s) and who

is certified by the State of Arizona in the case of specialized inspections, such as (elevators, boiler, and fire sprinkler suppression systems) and/or is authorized by the Qualified Facility owner(s) to engage a Licensed contractor for the type of work being performed.

QUALIFIED AGENT is a person(s) authorized to represent the business Owner(s) of a Qualified Facility, registered and residing in the State of Arizona, and who shall be responsible to the business owner(s) for compliance with the substantive provisions of this code.

QUALIFIED FACILITY is an existing structure(s) owned by an individual(s), firm, corporation, or legal entity engaged in the business of manufacturing, processing, providing services or other commercial enterprise. The Qualified facility includes all existing Specialized Buildings and related building service equipment, all of which shall be an integral part of the business of manufacturing, processing, providing services, or other commercial enterprises of business owner(s). Subject to Project Scope Limitations, the Qualified facility under an Annual Facility Permit is generally exempt from the standard building permit requirements pertain to remodeling, repairs, alterations, improvements and conversions constructed completely within the original "footprint" of the existing structure(s). Any Qualified Facility which requires new additions, new detached facilities, or new facilities associated with all operations, shall require Development Review Board approval and shall meet all standard building permit requirements as set forth in Section 105.

SPECIALIZED BUILDING is an existing structure(s) that serves as an accessory building(s) as defined by Section 10-14-004-0001 of the City's Land Development Code, COF Ord.1690, and is used for the business of manufacturing, processing, provision of services, or other commercial enterprise of the Qualified Facility.

Add 105.1.2.2. Permit Issuance. Each applicant for an Annual Facilities Permit shall fill out an "Application for BUILDING/GRADING Permit" form. Each Qualified Facility shall require a separate application form. The information on the form shall include the following:

A. The name, address, phone number, and business operation of the Qualified Facility owner(s). The name, address, and phone number of the Qualified Agent (if any) for the business and proof of current technical registration and licensing by the State of Arizona. If the Qualified Agent is not an employee of the Qualified Facility owner(s), the contract shall be for at least a one-year term.

B. The name and phone number of the Qualified Facility Maintenance Staff Member for the Qualified Facility owner(s).

C. A statement that the Qualified Agent may on behalf of the Qualified Facility owner(s), contract with third party on-site inspectors and/or superintendents for completing work under the Annual Facility Permit. In addition, a statement that the Qualified Facility owner(s) assumes all Responsibility for

assuring that all work performed under the Annual Facility Permit meets the current Building Code standards.

D. A site plan clearly indicating the existing location and total square footage of the entire Qualified Facility at the site intended to be covered under the Annual Facility Permit, including all Specialized Buildings and building service equipment.

E. A statement describing the nature and extent of all work expected to be performed at the Qualified Facility under the Annual Facility Permit.

Add 105.1.2.2.1 The Annual Facility Permit applicant may schedule inspections using the blanket permit issued after pre-paying an hourly fee (currently $47/hour, Section 107 of the 1997 Uniform Administrative Code) and scheduling the inspection prior to any time limitations provided by the City of Flagstaff.

Add 105.1.2.2.2 The appropriate routing action shall be taken by the City's Building Official for review of each Annual Facility Permit application. The applicant shall be notified upon approval or denial. If the application is disapproved, the applicant may appeal such decision to the Building and Fire Code Board of Appeals (Resolution 2001-42, 19 June 2001) no later than fourteen (14) calendar days after receipt of notice of disapproval. The fee for filing an appeal is $250, which is non-refundable.

Add 105.1.2.3 Permit Expiration. The Annual Facility Permit(s) shall be valid for a period of one year from the date of issue. The Annual Facility Permit shall be renewed annually and timely payment of annual renewal fee shall be made prior to performing any further permitted work.

Add 105.1.2.3.1 If the Qualified Agent's contract or employment at the Qualified Facility terminates prior to the expiration of the Annual Facility Permit, the Qualified Facility owner(s) shall notify the City's Building Official in writing within seven (7) calendar days. The Qualified Facility owner(s) shall engage a replacement Qualified Agent within fifteen (15) calendar days or the Annual Facility Permit shall automatically terminate. Application for a new Annual Facility Permit(s) shall be submitted with payment of new fees after fifteen (15) calendar days if no new Qualified Agent is contracted with or employed under the original Annual Facility Permit by that time. If the original Annual Facility Permit terminates and no new Annual Facility Permit is issued, then the Qualified Facility owner(s) shall complete any unfinished work with inspections provided by the City of Flagstaff at a regular hourly rate. No new projects may be started at the Qualified Facility under a terminated Annual Facility Permit.

105.1.2.4 Scope of Work. Project Scope Limitations shall be determined by project size (both dollar amount and physical area). Projects for remodeling, repairs, alterations, improvements, and conversions within the original "footprint" of the existing building(s) shall be limited

to $35,000 per project or no more than 25% of the original footprint area of the existing building(s) comprising the Qualified Facility.

Add 105.1.2.4.1 Projects may not alter or modify egress or required fire sprinkler systems without specific review and approval by the City's Building Official. Fire sprinkler systems shall require a separate permit issued through the City of Flagstaff Fire Department. Plan review shall be reimbursed at the hourly rate currently in effect.

Add 105.1.2.4.1 Projects may not be phased to circumvent the Project Scope Limitations. If the entire building is going to be renovated, or if there will be a significant change in occupancy, or if there will be a change in use, or if the portions of the building(s) will require demolition prior to renovation, then the Development Review Board and standard building permit process shall apply.

Add 105.1.2.4.3 A list of all projects underway or completed under the Annual Facility Permit shall be maintained by the Qualified Agent and made available for review by the City of Flagstaff Building Official upon request.

Add 105.1.2.4.4 All commercial demolition shall be subject to the rules established by Title 40, Code of Federal Regulations, Part 61, Subpart M, Asbestos NESHAP; Arizona Revised Statutes Title 49, § 49-421 et. seq. and § 49-471 et seq.; and Arizona Administrative Code, Title 18, Chapter 2, R18-2-1101. (See exemptions on page 3, Sec 61.145(a) Applicability).

CHAPTER 3 of IBC, USE AND OCCUPANCY CLASSIFICATIONS

Amend Section 308.2 to read:

308.2 Group I-1. To coincide with the State of Arizona Health Department, this occupancy shall include buildings, structures or parts thereof housing more than 10 persons on a 24-hour basis, who because of age, mental disability or other reasons, live in a residential environment that provides supervisory care services. The occupants are capable of responding to an emergency situation without physical assistance from staff. This group shall include, but not be limited to the following:

Residential board and care facilities
Assisted living centers
Halfway houses
Group homes
Congregate care facilities
Social rehabilitation facilities
Alcohol and drug abuse centers
Convalescent facilities

A facility such as the above with 10 or fewer persons shall be classified as a Group R-4 Condition 1 or shall comply with the *International Residential Code* in accordance with Section 101.2 where the building is in compliance with Section 419 of this code.

Amend Section 308.3 to read:

308.3 Group I-2. This occupancy shall include buildings and structures used for medical, surgical, psychiatric, nursing, custodial, personal, or directed care on a 24-hour basis of more than 5 persons who are not capable of self-preservation by responding to an emergency situation without physical assistance from staff. This group shall include but not be limited to the following:

Hospitals
Nursing homes (both intermediate care facilities and skilled nursing facilities)
Mental hospitals
Detoxification facilities
A facility such as the above with 5 of fewer persons shall be classified as a Group R-3 or shall comply with the *International Residential Code* in accordance with Section 101.2

This occupancy shall also include building and structures used for assisted living homes providing supervisor, personal, or directed care on a 24-hour basis of more than 10 persons who are not capable of self-preservation by responding to an emergency without physical assistance from staff. A facility such as the above with 10 or fewer persons shall be classified as an R-4 Condition 2.

Amend Section 310.1, R-4 to read:

Residential occupancies shall include buildings arranged for occupancy as residential care/assisted living homes including not more than 10 occupants, excluding staff.

Amend Section 310.1 by adding:

310.1.1 Condition 1. This occupancy condition shall include facilities licensed to provide supervisory care services in which occupants are capable of self-preservation by responding to an emergency situation without physical assistance from staff. Condition 1 facilities housing more than 10 persons shall be classified as a Group I-1.

310.2 Condition 2. This occupancy condition shall include facilities licensed to provide personal or directed care services in which occupants are incapable of self-preservation by responding to an emergency without physical assistance from staff. Condition 2 facilities housing more than 10 persons shall be classified as Group I-2.

R-4 occupancies shall meet the requirements for construction as defined in Group R-3 except as otherwise provided for in this code and Section 419 or shall comply with the *International Residential Code* in accordance with Section 101.2 where the building is in compliance with Section 419 of this code.

Amend Section 310.2 by changing:

PERSONAL CARE SERVICE. Assistance with activities of daily living that can be performed by persons without professional skills or professional training and includes the coordination or provision of intermittent nursing services and the administration of medications and treatments.

RESIDENTIAL CARE/ASSISTED LIVING HOME. A building or part thereof, housing a maximum of 10 persons, excluding staff, on a 24-hour basis, who because of age, mental disability or other reasons, live in a supervised residential environment which provides supervisory, personal, or directed services. This classification shall included, but not be limited to the following: residential board and care facilities, assisted living homes halfway houses, group homes, congregate care facilities, social rehabilitation facilities, alcohol and drug abuse centers and convalescent facilities.

Amend Section 310.2 by adding:

DIRECTED CARE SERVICE. Care of residents, including personal care services, who are incapable of recognizing danger, summoning assistance, expressing need, or making basic care decisions.

SUPERVISORY CARE SERVICE. General supervision, including daily awareness of resident functioning and continuing needs.

Amend Section 419 in its entirety to read as follows:

Section 419 RESISDENTIAL CARE/ASSISTED LIVING HOMES

419.1 Applicability. The provisions of this section shall apply to a building or part thereof housing not more than 10 persons, excluding staff, on a 24-hour basis, who because of age. Mental disability or other reasons, live in a supervised residential environment which provides licensed care services. Except as specifically required by this division, R-4 occupancies shall meet all applicable provisions of Group R-3.

419.2 General. Buildings or portions of buildings classified as R-4 occupancies shall meet all the applicable provisions of Group R-3. and may be constructed of any materials allowed by this code. The building or buildings shall not exceed two stories in height nor be located above the second story in any building, and shall not exceed 2000 square feet above the first story except as provided in Section 506.

419.3 Special Provisions. R-4 occupancies having more than 2000 square feet of floor area above the first floor shall be of not less than one-hour fire-resistive construction throughout.

419.3.1 Mixed Uses. R-4 occupancies shall be separated from other uses as provides in Table 302.3.2.

419.4 ACCESS AND MEANS OF EGRESS FACILITIES.

419.4.1 Accessibility. R-4 occupancies shall be provides with at least one accessible route per the Arizonans with Disabilities Act. Sleeping rooms and associated toilets shall be accessible.

Exception: Existing buildings shall comply with Section 3409. Bathing and toilet facilities need not be made accessible, but shall be provided with grab bars in accordance with ICC/ANSI A117.1.

419.4.2 EXITS

409.4.2.1 Number of Exits. Every story, basement, or portion thereof shall have not less than two exits.

Exception: Basements and stories above the first floor containing no sleeping rooms may have one means of egress as provided in Chapter 10.

419.4.2.2 Distance to Exits. The maximum travel distance shall comply with Section 1004, except that the maximum travel distance from the center point of any sleeping room to an exit shall not exceed 75 feet.

419.4.2.3 Emergency Exit Illumination. In the event of a power failure, exit illumination shall be automatically provided from an emergency system powered by storage batteries of an onsite generator set installed in accordance with the 2011 *National Electrical Code.*

419.4.2.4 Emergency Escape and Rescue. R-4 occupancies shall comply with the requirements of Section 1025, except that Exception 1 to Section 1025.1 does not apply to R-4 occupancies.

419.4.2.5 Delayed Egress Locks. In R-4 Condition 2 occupancies, delayed egress locks shall be permitted in accordance with Section 1008.1.3.4 and 1008.1.8.6 items 1,2,4,5 and 6.

419.5 SMOKE DETECTORS AND SPRINKLER SYSTEMS

419.5.1 Smoke Alarms. All habitable rooms and hallways in R-4 occupancies shall be provided with smoke alarms installed in accordance with Section 907.2.10.

419.5.2 Sprinkler Systems. R-4 occupancies shall be provided with a sprinkler system installed in accordance with Section 903.2.9. Sprinkler systems installed under this Section shall be installed throughout, including attached garages, and in Condition 2 facilities, and shall include attics and concealed spaces of or containing combustible materials. Such systems may not contain unsupervised valves between the domestic water riser control valve and the sprinklers. In R-4 Condition 2 occupancies, such systems shall contain water-flow switches electrically supervised by an approved supervising station, and shall sound an audible signal at a constantly attended location.

CHAPTER 5 of IBC, GENERAL BUILDING HEIGHTS AND AREAS

Amend Section 509, "Tenant Space Separation" by adding:

Section 509.1 All tenant spaces within a single structure shall be separated by a wall constructed of wood or metal studs and covered with a minimum of ½" drywall material on each side from the finished floor to the underside of the roof deck or flooring above. Walls can be constructed of any material approved by the Building Code. Requirements for fire rated separations will be governed by the different types of occupancy and materials and protection requirements are covered in Chapter 7, 8 and 9 of this code.

CHAPTER 15 IBC, ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

Revise the amendment to Section 1506.3 with the following language:

All roofing materials used must be a class "A" or "B" material and rolled roofing is to be of a self-adhering polymer bitumen type material . (Amended, Ord. 2009-06, 07/18/2009)

Amend Sections 1507.8 and 1507.9 by deleting each section in their entirety.

CHAPTER 18 of IBC, SOILS AND FOUNDATIONS

Amend Sections 1805.2 and 1805.4 by adding:

1805.2.4 and 1805.4.6 Footing Reinforcement. A minimum of 2-#4 steel reinforcement spaced per ACI 318, Section 7.5 shall be required in all footings.

Amend 1805.4.1 by changing the last line of the first paragraph to:

The minimum width of footings shall be 16 inches.

Amend Table 1805.4.2 by changing:

12 and 15 inch width of footing to 16 inches minimum.

6 inch thickness of footing to 8 inches minimum.

Amend Section 1805.5.2.2 by adding paragraph number 8:

8. Masonry foundation walls shall be solid grouted up to floor slab.

CHAPTER 31, IBC, SPECIAL CONSTRUCTION

Revise the amendment to Section 3109, Swimming Pool Enclosures and Safety Devices, as follows:

Refer to the Arizona Revised States (ARS) governing pool enclosure requirements. (Amended Ord. No. 2011-12, (July 19, 2011)

INTERNATIONAL BUILDING CODES (IBC), 2006 EDITION – APPENDICES

Adopt as the following appendices with the exceptions and/or amended language as follows:

Appendix B – Board of Appeals

Appendix C – Group U – Agricultural Buildings

APPENDIX I – Patio Covers

APPENDIX J - Grading

(Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008; Amended, Ord. 2009-06, 07/18/2009; Amended Ord. 2011-12, July 19, 2011)

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-04
INTERNATIONAL PLUMBING CODE

Sections:

4-04-001-001 **Amendments, Additions, and Deletions**

The following provisions shall have the effect of either amending, adding to, or deleting from the International Plumbing Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

CHAPTER 3, GENERAL REGULATIONS

Amend Section 301.3 by adding to the end of the paragraph:

This section shall not be construed to prevent indirect waste systems required by Chapter 8.

Exception: Bathtubs, showers, lavatories, clothes washers and laundry trays shall not be required to discharge to the sanitary drainage system where such fixtures discharge to an approved gray water system for flushing of water closets and urinals or for subsurface landscape irrigation.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Section 301.7 to read:

Where conflicts between this Code and the conditions of the listing or the manufacturer's installation instructions occur, the listing or manufacturer's installation requirements shall apply.

Amend last sentence of Section 305.6 to read:

Exterior Water supply piping shall be installed not less than thirty (30) inches (765 mm) below grade.

Change the amendment to Section 305.6.1 by adding the following language:

Building sewers that connect to private sewage disposal systems shall be regulated by the Coconino County Health Department. Building sewers for single family detached buildings on City provided sewer shall be a minimum of twelve (12) inches (306 mm) below grade.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Section 312.1, changing the ninth sentence to read:

All plumbing system piping shall be tested with either water or air.

Amend Section 312.4 to DELETE in its entirety.

Amend Section 312.6 to DELETE in its entirety.

Amend Section 312.7 to DELETE in its entirety.

CHAPTER 4, FIXTURES, FAUCETS AND FIXTURE FITTINGS

Amend Section 419, Urinals by adding a new sub-section:

419.4 Urinals. All new commercial, institutional, and public facility construction or additions and alterations to restrooms in commercial, institutional, and public facilities shall install waterless urinals

Amended Ord. 2007-48, 01/15/2008; Amended, Ord. 2009-06, 07/18/2009; Amended Ord. No. 2011-12, July 19, 2011

Chapter 5, WATER HEATERS

Amend Section 501 by adding:

501.9 Energy Efficiency. Water heaters must be insulated using exterior "jackets" or, "Energy Star" or energy conservation rated appliances that have pre-installed insulation, the insulation information must be available on the appliance at the time of final inspection. A minimum total insulation value of R-16 must be achieved. (This applies to new installation or replacements.)

CHAPTER 6, WATER SUPPLY AND DISTRIBUTION

Amend Table 604.4 by changing the following values:

Maximum Flow Rate or Quantity for a Water Closet to Max. 1.3 gal.(HET)

Amend Section 607.2 by deleting the section in its entirety.

Amend Section 610 to DELETE in its entirety.

CHAPTER 7 SANITARY DRAINAGE

Amend Section 703 by adding a new section:

703.6 Building Sewer Locating Means. All non-metallic building sewer piping shall be installed with a plastic covered No. 12 AWG Type UF 600V tracer wire taped to the top of the piping with a minimum 10 mil tape. The building sewer tracer wire shall be green in color.

CHAPTER 9, VENTS

Revise the amendment to Section 904.1 to read:

"…terminated at least 12 inches (306 mm) above the roof."

(Amended Ord. No. 2011-12, (July 19, 2011)

Adopt the Appendix C, Gray Water Recycling Systems, as written.

Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-05

NATIONAL ELECTRICAL CODE

Sections:

4-05-001-0001 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the National Electrical Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

ARTICLE 110, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

Amend Article 110.2 by adding:

All electrical conductors, components, material and equipment shall be listed and labeled.

Amend Article 110.5 to read:

Conductors used to carry current shall be of copper only. Where the conductor material is not specified, the material and the sizes given in this Code shall apply to copper conductors. The use of aluminum wire shall be approved for feeders and service entrance conductors only and shall not be used for branch circuit wiring.

Amend Article 110.7 by adding:

All equipment rated at 1000 amperes or more shall be tested for insulation breakdown, mechanical integrity, and workmanship prior to the equipment being energized. A certified Hi-pot test shall be performed and a certificate issued to the City of Flagstaff Project Inspection Program, Development Services Section. This test shall be performed in the presence of a City of Flagstaff Building Inspector and conducted by a testing firm approved by the Building Official.

Said test shall be performed for a period of one (1) minute, the application of a 60 hertz alternating potential of 1000 volts plus twice the rated phase to phase voltage of the equipment.

This test shall be performed between all phases to ground, phase to phase, and neutral if isolated.

ARTICLE 210, CIRCUITS

Amend Article 210.5 by adding:

(D) Color Code. Where 15, 20, or 30 amp branch circuits requiring a neutral are installed in race ways or cable assemblies, the conductor of branch circuits connected to the same system shall conform to the following color code:

Volts	Phase	System	Phase A	Phase B	Phase C	Neutral
120/208	3	Wye	Black	Red	Blue	White
120/240	3	Delta	Black	Orange	Blue	White
277/480	3	Wye	Brown	Orange	Yellow	Gray

ARTICLE 250, GROUNDING

Amend Article 250.30 (A) (2) by adding:

(a) All new building construction shall have a one piece concrete-encased electrode and electrode conductor (Ufer), a minimum twenty (20) feet in the footing, sized from the following table:

0-200 Amp Service	1 piece #4 copper (electrode and electrode conductor)
400 Amp Service	1 piece 1/0 copper (electrode and electrode conductor)
600 Amp Service	1 piece 2/0 copper (electrode and electrode conductor)
Larger than 800 Amp Service	1 piece 3/0 copper (electrode and electrode conductor)

Where the Ufer has been lost, damaged, or un-located, a ground ring or modification of the same consisting of thirty (30) feet of #2 bare copper wire, buried a minimum of thirty (30) inches deep in a trench, or a Plate electrode per 250.53 (H) and per 250.56 shall be required in lieu of a concrete-encased electrode. Services larger then 200A shall be sized from the table above.

(Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008; Amended Ord. No. 2009-06, 07/18/2009; Amended Ord. 2011-12, July 19, 2011)

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-06

INTERNATIONAL MECHANICAL CODE

Sections:

Section 4-06-001-0001 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the International Mechanical Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

CHAPTER 3, General Regulations

Revise the amendment to Section 303.4 as follows:

Refer to amendments to the IFGC Section 305.5 for requirements.

(Amended Ord. No. 2011-12, (July 19, 2011)

Amend Section 304.2 to read:

Where conflicts between this Code and the conditions of the listing or the manufacturer's installation instructions occur, the listing and manufacturer's installation requirements shall apply.

Amend Section 304.6 to read:

Appliances located in private garages and carports shall be installed per Section 303.3 and/or 304.4.

Amend Section 306.1 by adding to the last sentence "or the removal of any other appliances."

CHAPTER 9, IMC, SPECIFIC APPLIANCES, FIREPLACES, AND SOLID FUEL-BURNING EQUIPMENT

Amend Section 903.3 to read:

An unvented gas log heaters shall not be installed at any time unless first approved by the local gas utility company. A signed and dated letter of such approval shall be submitted to the Building Official before a permit can be issued.

Amend Section 928, Unvented Room Heaters, by adding:

928.1 Installation. Vent free appliances shall not be installed unless first approved by the local gas utility company. A signed and dated letter of such approval shall be submitted to the Building Official before a permit can be issued.

CHAPTER 10, BOILERS, WATER HEATERS and PRESSURE VESSELS

Amend Section 1002.1 by changing the second sentence to read:

All water heaters shall be capable of being removed without first removing a permanent portion of the building structure or removing another appliance.

(Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008 Amended Ord. No. 2009-06, 07/18/2009; Amended Ord. No. 2011-12, July 19, 2011)

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-07

INTERNATIONAL FUEL GAS CODE

Sections:

Section 4-07-001-0001 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the International Fuel Gas Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

(Amended Ord. 2011-12, July 19, 2011)

CHAPTER 3, GENERAL REGULATIONS

Amend Section 303.3 by deleting numbers 3 and 4.

Delete the following amendments to Chapter 3:

Amend Section 305.5. Private Garages by deleting in its entirety and replacing with:

> Appliances shall not be installed in a location where subject to mechanical damage unless protected by approved barriers such as steel bollards filled with concrete, poured in place concrete curb, or installed a minimum 24 inches above the floor. Appliances not subject to mechanical damage shall be installed per Section 305.3

Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008; Amended Ord. No. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, July 19, 2011)

CHAPTER 4, GAS PIPING IMSTALLATIONS

Amend Section 403.4.3. Copper and Brass, delete and replace with:

> Copper and brass pipe, threaded copper, brass and aluminum piping shall not be used for gas piping installations within the City of Flagstaff.

Amend Section 406.4.1. Test Pressure, to read:

> The test pressure to be used shall be no less than ten (10) pounds per square inch gauge pressure or six (6) inches of mercury measured with a manometer or slope gauge for single family dwellings or for systems with less than fifteen (15) pounds per square inch or fourteen (14) inches of water column. Welded piping and piping that carries gas at pressure in excess of fourteen (14) inches of water column or fifteen

(15) pounds per square inch shall be tested with no less than sixty (60) pounds per square inch. The test gauge shall not be more than twice the test pressure and in 1/10 pound increments or less.

Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008; Amended Ord. No. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, July 19, 2011)

Amend Section 406.4.2. Test Duration, to read:

Test duration shall be no less than fifteen (15) minutes for single family dwellings or systems with less than fifteen (15) pounds per square inch, fourteen (14) inches of water column. Welded piping, and systems with fifteen (15) pounds per square inch (14 inches of water column) or more shall be tested for no less than thirty (30) minutes.

CHAPTER 6, SPECIFIC APPLIANCES

Amend Section 614.5. Makeup air, by deleting the first sentence:

Installations exhausting more than 200 cfm (0.09 m3/s) shall be provided with makeup air.

Amend Section 621. Unvented Room Heaters, to be deleted in its entirety.

Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008; Amended Ord. No. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, July 19, 2011)

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-08

INTERNATIONAL EXISTING BUILDING CODE

Sections:

4-08-001-0001 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the International Existing Building Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

CHAPTER 1, ADMINISTRATION

Amend Section 105.1.1. Annual Permit, by referencing City of Flagstaff 2011 Code Amendments to the International Building Code (IBC), 2006 Edition for requirements and compliance issues.

Amend Section 105.5. Expiration, by referencing City of Flagstaff 20011 Code Amendments to the International Residential Code (IRC), 2006 Edition and International Building Code (IBC), 2006 Edition for requirements and compliance issues on the duration of building permits.

CHAPTER 11, HISTORIC BUILDINGS

Revise the amendment to Section 101.2 as follows:

Amend Section 1101.2 Report by adding Section 1001.2.1 as follows:

Section 1101.2.1, Any changes to a structure in a historic district or to buildings listed on the City of Flagstaff Historic Registry shall be reviewed by the Community Investment Division, Historic Preservation representative, and Project Management Section, Development Services Division prior to issuing a building permit. The project may be referred to the Development Review Board and/or the Historic Preservation Commission for complete staff review by the board members.

(Amended Ord. No. 2011-12, July 19, 2011)

Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008; Amended Ord. No. 2009-06, 07/18/2009) (Amended Ord. No. 2011-12, July 19, 2011)

2011 AMENDMENTS TO FLAGSTAFF CITY CODE, TITLE 4, BUILDING CODE

CHAPTER 4-09

INTERNATIONAL ENERGY CONSERVATION CODE

Sections:

Section 4-09-001-0001 Amendments, Additions, and Deletions

The following provisions shall have the effect of either amending, adding to, or deleting from the International Energy Conservation Code adopted in Flagstaff City Code, Title 4, Building Regulations, Chapter 4-01, Administrative Enactments, Section 4-01-001-0002, Adoption.

CHAPTER 4, RESIDENTIAL ENERGY EFFICIENCY

Add the following amendments to Chapter 4:

Amend Section 402.1.1 by adding:

Insulation values in 2x6 wall construction will remain the same at R-19.

Exception: Insulation values in existing 2x4 wall construction will remain at R-15 (high density).

(Amended Ord. No. 2011-12, July 19, 2011)

Amend Section 402.1.3.1 Window Fenestration

All new construction and replacement windows to have National Fenestration Rating Council (NFRC) total unit U-factor of 0.45 or less. Windows shall also be low-E where practical (not recommended for southern exposures) or not being used for solar heat gain to fuel a solar massing device. (Amended Ord. No. 2011-12, July 19, 2011)

Amend Section 403 by adding:

Section 403.1.2 All new construction and replacement heating units (optional for hydronic in-floor heating systems) will have Programmable thermostats.

(Amended Ord. No. 2011-12, July 19, 2011)

Section 403.7 Furnaces: All furnaces installed in new construction shall be 90% condensing type furnaces.

Exception: Replacement furnaces are to be voluntarily 90% condensing type furnaces.

(Amended Ord. No. 2011-12, July 19, 2011)

Section 403.8 Water heaters shall either be insulated using exterior "jackets" or for "Energy Star" or energy conservation rated appliance that have pre-installed insulation. The insulation information must be available on the appliance installed at the time of final inspection. A minimum total insulation value of R-16 must be achieved. (This applies to new installation or replacements.)

Exception: The R-16 is not required when the existing room size prohibits the larger sized water heater and the Manufacturer's listing prohibits the use of insulation jackets.

(Amended Ord. No. 2011-12, July 19, 2011)

Section 403.9 A carbon monoxide (CO) detector shall be installed at the house/garage entry door and within each utility room where combustion appliances are used (sealed combustion appliances are exempt). A laundry room which uses gas appliances would require a detector.

Section 403.10 All hot water supply lines (both ½" and ¾") will be insulated with a minimum of R3.6 wrap insulation; or ½" foam covers. All joints between sections of insulation will be snuggly butted together and wrapped with duct tape.

Section 403.11 All newly installed toilets must be "high efficiency toilets" (HET) units which have a maximum of 1.3 gallons for solids. (Special attention to this change needs to be addressed by suppliers and home improvement centers which stock the older style units).

Section 403.13 A construction waste reduction/reuse plan will be written and provided at the time of building permit submittal for new construction of all new commercial projects (apartments and condominiums), townhouse subdivisions and or single family detached builders who submit for more than 15 permits within a subdivision during any one calendar year. The plan must address construction waste to include cardboard, drywall, foam, metal, concrete, masonry and asphalt.

Section 403.14 All appliances, refrigerators, freezers, washers, dryers, cook stoves, that are supplied by the contractor shall be Energy Star.

(Amended Ord. No. 2011-12, July 19, 2011)

Amend Chapter 4 by adding Section 405.

Section 405 Best Practices: The following items are recommended but not required in all new residential construction.

Section 405.1: *Future Solar Water Heater.* All new residential construction shall be built so as to accommodate a future installation of a solar water tank. Ceilings within the water heater compartment shall be a minimum 8 foot in height. Either insulated plumbing for

standard inter-connect to a roof mounted system will be pre-plumbed or adequately sized chase/access panel provided between the water heater compartment and the attic space will be installed.

Exception: Single story single family dwellings.

Section 405.2: *Future Solar Photovoltaic.* All new residential construction shall be supplied with a minimum ¾ inch electrical conduit, with a pull wire, for the future installation of a solar photovoltaic system. The conduit shall be run from the inside of an accessible attic crawl space to the electrical service entrance section.

Section 405.3: *Future Alternative Energy Systems. (Wind Turbines or geo-thermal):* Working drawings prepared by the owner builder, contractor, draftsperson or design professional should indicate possible location of expansion to accept alternative energy systems. This can be demonstration by indicating location of future accessory service panels for electrical systems or expansion capability of mechanical rooms for boilers and control systems.

Section 405.4: *Voluntary Sustainability Programs.* This allows the voluntary use of LEED, Coconino county sustainable checklist, National Green Building Standard, NAHB 2008, ICC 700-2008. This allows the builder or property owner to participate in sustainable programs that are not listed in the International Energy Conservation Code, 2006 edition.

Section 405.5: *Jump Ducts.* Provide an air balancing device between adjoining rooms to allow equalization of air pressure and temperatures between rooms.

Section 405.6: *Exterior Wall Insulation.* Contractor to increase R-19 to R-24 insulation using high density or spray applied foam insulation in exterior framed walls.

Section 405.7: *Protection of Cold Water Supply Lines*. Add R-19 insulation to water supply lines that are exposed in crawl spaces.

Section 405.6: Lighting. At the time of final inspection, the builder, contractor, or owner may install compact fluorescent lights (CFLs), other fluorescent, LEDs or other energy efficient lighting equivalent to or better than fluorescents in the high use areas for new construction. High use areas are typically defined as kitchens, living room, family room, and dining area. Specialty type lighting fixtures shall be of a low wattage or low voltage type.

Exception: Specialty lighting (chandeliers and under counter halogen lights) may be used in living rooms, dining rooms and kitchens. Recessed spot lights will use CFL's or LED's and reostats must be rated for their use.

Section 405.7: Wood floors in new construction may have an insulation value of R-30.

Section 405.8: Insulation in contact with the ground may be extruded polystyrene of other foam products other than expanded polystyrene.

Section 405.9: Hot water re-circulating pumps are to have a programmable timer, an on/off switch, and ¾ inch foam pipe insulation.

Section N1105.10 Dual Plumbing. All new residential single family detached units are "voluntarily" requested to install the piping only for dual plumbed for "gray water" disposal and conservation efforts. Access for future valving must be provided and the initial installation will be connected to sanitary sewer. The piping shall be installed in accordance Appendix C, Gray Water Recycling Systems, of the International Plumbing Code, 2009 Edition, and the regulations established by ADEQ. Reference Type 1 General Permit Best Management Practices for the 13 points of using gray water, at www.adeq.state.az.us or call at 1-800-234-5677.)

(Amended Ord. No. 2011-12, July 19, 2011)

CHAPTER 5 COMMERCIAL ENERGY EFFICIENCY

Amend Chapter 5 by deleting Sections 505.6.1 through 505.6.2 and replace with:

City of Flagstaff has an exterior lighting permit requirement, enforces a "Dark Sky Ordinance" and requires review by zoning enforcement and the Project Management Section prior to installation. Lumen calculations are required and amounts are limited by property size and use.

(Amended Ord. No. 2007-47, 12/18/2007; Amended Ord. 2007-48, 01/15/2008; Amended Ord. No. 2009-06, 07/18/2009; Amended Ord. No. 2011-12, July 19, 2011)